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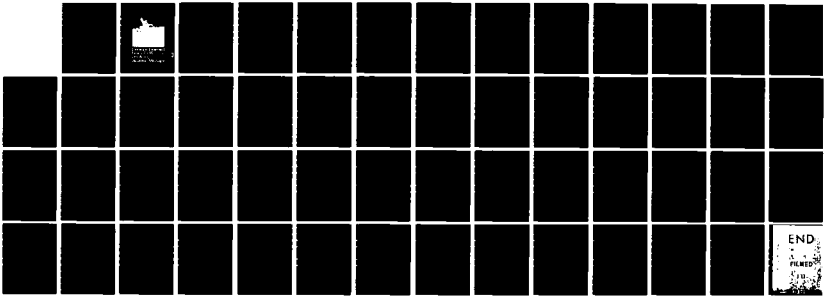

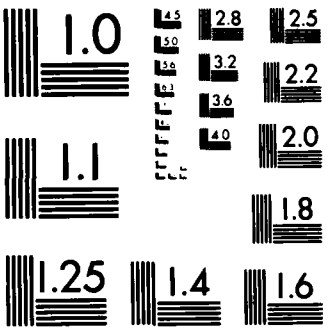

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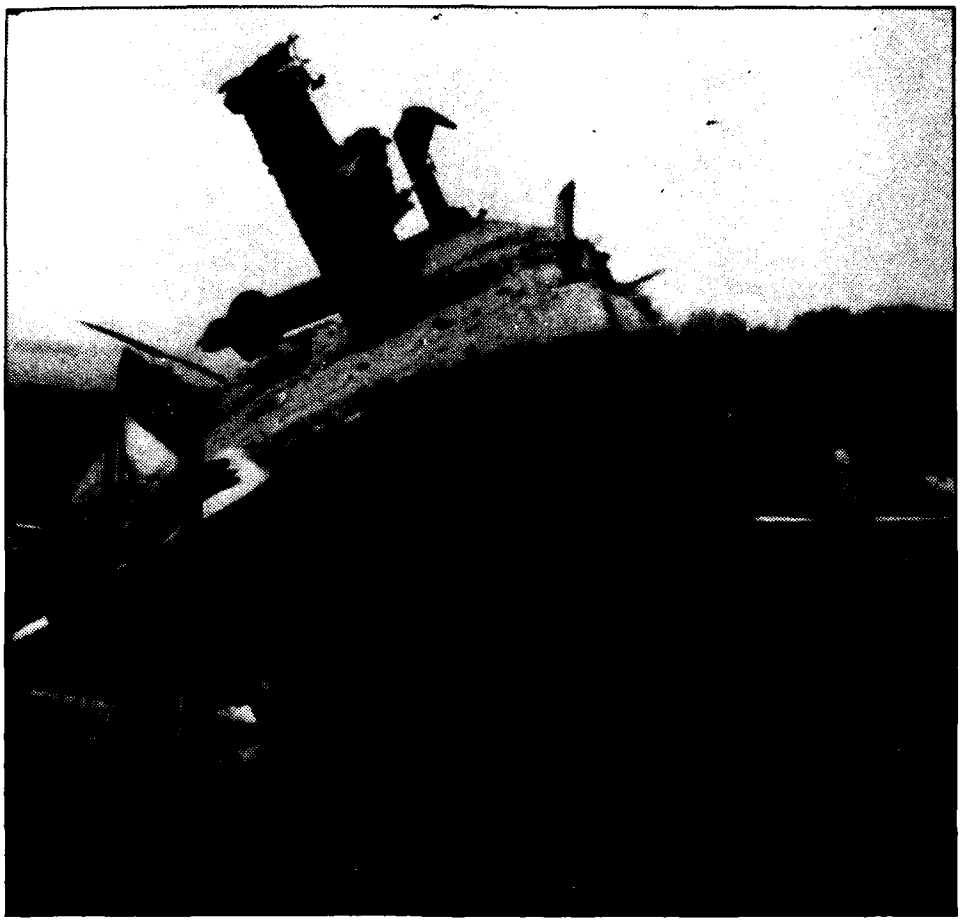

Lessons Learned From FY 82 US Army Aviation Mishaps

U.S. ARMY SAFETY CENTER

Lessons Learned From FY82 US Army Aviation Mishaps

Prepared by
Grover D. Lindsey
Darwin S. Ricketson, Jr.
Matilda J. Reeder
Cecil Smith

Analysis and Research Division
Darwin S. Ricketson, Jr.
Chief

Directorate for
Investigation, Analysis and Research
Colonel D.C. Ammons
Director

Colonel Joseph R. Koehler
Commander

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US Army aviation mishap data (96 cases) for FY 82 were analyzed. Lessons learned and corrective actions are identified and presented in Section I. Section II details the results of a survey of three US Army aviation battalion/squadron organizations with good safety records. Observations on the factors contributing to their successful safety efforts are provided.

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FOREWORD

The Army's record of conserving aviation resources in fiscal year 1982 was a poor one. The Class A aircraft mishap rate was the worst since fiscal year 1973. The sharp increase in mishaps was not confined to any particular aircraft system or level of aircrew experience. The mishaps spanned the entire fleet of aircraft and were spread across the entire range of aviator experience levels.

This report identified the lessons learned from the analysis of 96 Class A, B, and C mishaps costing $10,000 or more. The common thread running through most of these mishaps is human error, particularly a lack of professional self-discipline on the part of aircrews. These mishaps are a serious drain on the Army's combat readiness and cause for concern.

The elimination of substandard performance must become a high priority of all those who command, manage, and supervise aviation operations. The costly lessons learned last year must be applied to prevent these causes from creeping back into the aviation system, unrecognized by commanders and aircrews, and causing "new" mishaps.

Commanders should find Section II of this report especially valuable. This section is a summary of the ingredients of successful aviation mishap prevention programs.

JOSEPH R. KOEHLER
Colonel, IN
Commanding

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SECTION I

LESSONS LEARNED FROM ARMY AVIATION MISHAPS

INTRODUCTION

During fiscal year (FY) 82, there were 4,483 Army aircraft mishaps. These mishaps resulted in 86 fatalities, 115 nonfatal injuries, 51 destroyed aircraft, and $63.6 million in costs. Aircraft mishap losses are a serious drain on the combat readiness of the Total Army.

Just as air and ground elements are integral parts of a single force, aviation mishap prevention and readiness training programs must work together to provide a combat-ready Army. This report was developed to provide commanders with the costly lessons learned in FY 82 and corrective actions necessary to prevent future mishaps from the same causes. Human factors lessons are presented according to the aircrew training manual task involved. Materiel factors lessons are presented according to the major hardware system involved.

Ninety-six FY 82 class A, B, and C aircraft mishaps costing $10,000 or more were analyzed. These mishaps were selected for analysis because they were responsible for nearly all the resource losses in aviation mishaps (90% of cost, 100% of fatalities, and 93% of nonfatal injuries). The analysis identified lessons learned in terms of problems in the Army aviation system and mishap cause factors that resulted from these problems.

SUMMARY OF FINDINGS

1. The 96 mishaps led to 56 different lessons being learned.*

2. Human error was a factor in 85 percent of the mishaps analyzed and 74 percent of the cost while materiel failure was responsible for 15 percent of the mishaps and 26 percent of the cost (Table 1).

3. Seventy-one percent of all aircrew task errors involved three tasks: emergency (36%), approach and landing (20%), and hovering (15%) (Table 1).

4. Seventy-five percent of the mishaps analyzed were caused by three factors (Table 2).

a. Lack of self-discipline (45%)--aviators knowingly violating regulations, operating procedures, or prudent air discipline of their own volition; i.e., problems of attitude, motivation, attention, composure, or overconfidence.

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*A lesson learned may involve more than one mishap, aircraft, task error, materiel failure, system inadequacy, and/or corrective action. Corrective actions were based on recommendations from the mishap reports (DA Form 2397 series).

b. Supervisory error (19%)--failure of commanders and immediate supervisors to ensure by-the-book performance of aviators.

c. Inadequate design (11%) of aircraft engines, tail rotors, and drive trains.

5. Most of the recommended corrective measures require action by the unit commanders because lack of aviator discipline and failure to supervise are primarily unit-level problems.

CONCLUSIONS

1. Inadequate self-discipline and inadequate supervision are Army-wide problems as well as unit-level problems.

2. The Army can no longer accept the risk of aviators who knowingly and willfully violate rules and regulations, and consequently cause aircraft mishaps. Army-level action must be taken regarding these high-risk aviators.

3. In addition to Army-level action regarding high-risk aviators, senior aviators must take the lead in "policing their own," and unit commanders must insure that aviators are held accountable for their own actions before mishaps occur.

NOTE: This "Lessons Learned" report will replace a previous annual report "Analysis of US Army Aircraft Accidents".

TABLE 1. Aircrew training manual tasks and aircraft types involved in lessons learned

Aircrew Training Manual Tasks	AIRCRAFT TYPES: Observation OH-58 OH-6A	Utility UH-1 UH-60	Attack AH-1S	Training TH-55	Cargo CH-47	Fixed Wing OV-1,T-42,U-8	Totals
Flight Planning	1*	2					3
	1**	4					5
	$60***	$3,946					$4,006
Before-Flight Inspection		1				1	2
		1				1	2
		$648				$38	$686
Hovering	4	1	2		1		8
	5	4	2		1		12
	$380	$3,513	$105		$122		$4,120
Takeoff	2	1	1	1			5
	2	1	1	1			5
	$1,065	$1,444	$205	$34			$2,748
Basic Flight	1					1	2
	1					1	2
	$194					$3,190	$3,384
Approach and Landing	1	6	2	1	1	3	14
	1	9	2	1	1	3	17
	$248	$3,535	$2,480	$50	$43	$4,798	$11,154
Emergency	6	2	6			1	15
	16	5	6	1	1		29
	$2,223	$2,707	$5,154	$12	$36		$10,152
Tactical and Special	1	3					4
	1	6					7
	$483	$5,761					$6,244
Ground Taxiing					2	1	3
					2	1	3
					$122	$48	$170
Materiel Failures	2	8	1	1	2		14
	2	8	1	1	2		14
	$174	$6,794	$2,235	$26	$5,395		$14,598
Lessons Learned	18	24	12	3	6	7	70
Number of Mishaps Involved	29	38	12	4	6	7	96
Total Cost	$4,827	$28,348	$10,179	$123	$5,682	$8,109	$57,262

*Number of lessons learned (a lesson learned may involve more than one mishap, aircraft, task error, materiel failure, system inadequacy, and/or corrective action)
**Number of mishaps
***Cost multiplied by $1,000

Table 2 - Aircrew training manual and system inadequacies involved in lessons learned.

Aircrew Training Manual Tasks	System Inadequacies									Total
	Written Procedure	Self Discipline	Supervision	Unit Training	Design	School Training	QC MFR	Maint	Other	
Flight Planning		4	1							5
Before Flight Inspection		2								2
Tactical and Special		4	3							7
Hovering	1	8	1	1					1	12
Take Off		3				1			1	5
Basic Flight		2								2
Approach and Landings		11	3						2	16
Emergency	4	7	9	1	7	1				29
Ground Taxiing		2		1						3
Materiel Failures			1		4		2	2	6	15
Total	5	43	18	3	11	2	2	2	10	96

Aircraft and task index

Aircrew Training Manual Tasks	AIRCRAFT TYPES					
	Observation OH-58 OH-6A	Utility UH-1 UH-60	Attack AH-1S	Training TH-55	Cargo CH-47	Fixed Wing OV-1,T-42,U-8
Flight Planning	*12	12,13				
Before-Flight Inspection		14				
Hovering	39,40,41,43	43	42,43		43	
Takeoff	23,25	22	24	21		
Basic Flight	27					26
Approach and Landing	31	29,32,33,34 35,36	35,37	37	38	28,29,30
Emergency	1,2,3,5,10	4,10	7,8,9,10,11	10		6
Tactical and Special	16	15,16,17				
Ground Taxiing					18,19	20
Materiel Failures	49,52	44,45,46,48	54	47	56,57	

*Lesson learned number

CORRECTIVE ACTIONS INDEX

Lesson Number	Action Agent		
	Unit Commander	TRADOC	DARCOM
1	X		X
2			X
3			X
4	X		
5	X		
6			X
7	X		
8		X	
9			X
10	X		
11	X		
12	X		
13	X		
14	X		
15	X		
16	X		
17	X		
18	X		
19	X		
20	X		
21		X	
22	X		
23	X		
24	X		
25	X		
26	X		
27	X		
28	X		
29	X		
30	X		
31	X		
32	X		
33	X		
34	X		
35	X		
36	X		
37	X		
38	X		
39	X		
40	X		
41			X
42	X		
43	X		
44	NA	NA	NA
45			X
46	X		

CORRECTIVE ACTIONS INDEX

Lesson Number	Action Agent		
	Unit Commander	TRADOC	DARCOM
47			X
48			X
49			X
50			X
51	NA	NA	NA
52			X
53	X		
54			X
55			X
56			X

ANTITORQUE MALFUNCTION

Lesson Learned #1: Failure to ensure that aircraft performance capabilities match mission demands results in placing aircraft into flight envelopes and environmental conditions exceeding aircraft capabilities.

Lesson Cost: Class A mishaps: OH-58 (3 cases)
Class B mishaps: OH-58 (3 cases)
Fatal injuries: 3
Nonfatal injuries: 5
Cost: $1,120,486

Problem: Aviators flying OH-58 helicopters encounter flight conditions where tail rotor effectiveness is lost. Adequate testing has not been performed to determine if the performance capabilities of this aircraft are adequate for its current mission.

Corrective Action: DARCOM perform studies and expedite research, testing, and fielding of design changes that will correct the OH-58 loss of tail rotor effectiveness problem. Unit commanders ensure training programs emphasize the hazards associated with loss of tail rotor effectiveness and familiarize observation helicopter pilots with tail rotor effectiveness limitations, early recognition of loss of tail rotor effectiveness, proper recovery procedures and conditions to avoid.

Lesson Learned #2: Failure to ensure the OH-58 operators manual provides adequate instructions for describing tail rotor malfunctions and the correct emergency procedures for coping with them increases the probability of an aviator incorrectly handling this type of emergency.

Lesson Cost: Class A mishaps: OH-58 (2 cases)
Fatal injuries: 1
Nonfatal injuries: 3
Cost: $631,595

Problem: About two pages in the OH-58 in the operators manual are delegated to a description of tail rotor malfunctions and emergency procedures. However, the terminology used is vague and the procedures described conflict from one paragraph to the next so that the reader is easily confused as to the required corrective actions.

Corrective Action: DARCOM revise procedures in the operators manual (chapter 9), concerning tail rotor malfunctions to ensure that corrective flight actions are expressed explicitly and without conflict.

Lesson Learned #3: Lack of means or space for securing items of equipment/loose gear required to be aboard utility and observation helicopters (OH-58, UH-1, and UH-60) increases the probability that items will be loosely stored and blown out of the aircraft and into the tail rotor.

Lesson Cost: Class A mishap: OH-58
Nonfatal injuries: 1
Cost: $148,527

Problem: OH-58 helicopters normally are flown with the aft doors open or removed. These aircraft do not have a kit bag or compartment in which to store/secure items of equipment required to be onboard. These items are blown out of the doors into the tail rotor, causing malfunctions and mishaps.

Corrective Action: DARCOM provide a means of securing items of equipment/loose gear required to be aboard OH-58, UH-1, and UH-60 helicopters and provide procedures in the operators manual detailing how and where these items are to be secured/stored.

HYDRAULIC SYSTEM MALFUNCTION

Lesson Learned #4: The failure of inexperienced instructor pilots to anticipate and recognize student pilot errors before training maneuver parameters are exceeded reduces the probability of reacting in time to correct improper flight control actions.

Lesson Cost: Class A mishap: UH-1
Fatal injuries: 4
Cost: $1,882,704

Problem: An instructor pilot was relatively new to instructor duties and had not fully developed a working knowledge of the parameters within which a student should be allowed to operate. This inexperience adversely affected his ability to anticipate and recover from student pilot errors, particularly those occurring during simulated aircraft system malfunctions, e.g., hydraulic system.

Corrective Action: Unit commander take positive command action to ensure inexperienced instructor pilots recognize the problems associated with inexperience, particularly those related to anticipating student errors. Additionally, ensure that instructor pilots are making special efforts to continually maintain the aircraft in a recoverable position in case the student pilot should make an error during simulated aircraft malfunctions.

EMERGENCY PROCEDURES

Lesson Learned #5: During precautionary landings, failure of pilots to establish a proper approach and maintain the aircraft within its autorotative envelope throughout the approach reduces the probability of a successful landing should an engine failure or other materiel failure occur.

Lesson Cost: Class B mishap: OH-6
Cost: $56,307

Problem: Pilots used a steep approach angle (15-20 degrees) and slow airspeed during precautionary landing instead of maintaining the aircraft in the autorotative envelope throughout the approach to landing sequence. As a result, when materiel failure occurred, (e.g., engine failure), the aircraft was not in a position for a successful autorotation.

Corrective Action: Unit commander take positive command action to inform aviators of the mishap problems and remedies, monitor aviator performance and enforce compliance with requirements for correct job performance.

Lesson Learned #6: Failure to ensure the U-8F operators manual provides adequate written procedures that describe the flight actions to take when unsafe gear-down indications occur decreases the probability of making safe landings.

Lesson Cost: Class C mishap: U8-F
Cost: $36,078

Problem: The U-8 operators manual contains inadequate written procedures on "what to do" when the U-8F aircraft gives unsafe gear-down indications. Consequently, pilots fail to operate the aircraft at maximum landing gear extended speed or apply light braking action after touchdown to assist in forcing unsafe landing gear into position.

Corrective Action: DARCOM revise the U-8F landing gear emergency procedures in TM 55-1510-201-10/5, to provide adequate guidelines for unsafe gear-down indications. Include procedures for operating the aircraft at maximum landing gear extended speed or light brake application after touchdown.

EMERGENCY PROCEDURES FOR NIGHT VISION GOGGLE FAILURE

Lesson Learned #7: Failure to follow established procedures in FM 1-51 regarding airspeed at night while night vision goggles are being used reduces the chances of maintaining aircraft control when the goggles fail.

Lesson Cost: Class A mishap: AH-1
Nonfatal injuries: 2
Cost: $1,609,321

Problem: While flying low level at night using night vision goggles, an aviator exceeded airspeed limitations listed in Figure 6-28, FM 1-51. As a result, when the night vision goggles failed, there was not enough time available to transfer aircraft control or remove the goggles to maintain safe flight.

Corrective Action: Unit commanders take positive command action to inform personnel of this problem, monitor aviator performance, and enforce compliance with requirements of FM 1-51.

SCAS MALFUNCTIONS

Lesson Learned #8: Failure to adequately train aviators to interpret SCAS hardover malfunctions in attack helicopters increases the probability aviators will incorrectly handle these emergencies.

Lesson Cost: Class A mishap: AH-1
Fatal injuries: 1
Nonfatal injuries: 1
Cost: $1,608,237

Problem: Attack helicopter pilots may misinterpret SCAS hardover failure as main transmission failure and apply improper flight control actions.

Corrective Action: TRADOC include adequate instructions during attack helicopter training for interpreting and taking corrective action for SCAS hardover malfunctions.

Lesson Learned #9: Failure to ensure the attack helicopter operators manual adequately describes the extremes of SCAS hardover malfunctions and methods for identifying these malfunctions, increases the probability aviators will incorrectly handle these emergencies.

Lesson Cost: Class A mishap: AH-1
Fatal injuries: 1
Nonfatal injuries: 1
Cost: $1,608,237

Problem: Attack helicopter pilots may misinterpret SCAS hardover failure as main transmission failure and apply improper flight control actions.

Corrective Action: DARCOM expand the description of SCAS malfunctions in TM 55-1520-136-10, para 9-73. Include an adequate description of the methods for identifying these malfunctions and the actions required to cope with the emergency.

AUTOROTATIONS

Lesson Learned #10: Failure of instructor pilot to properly monitor aviator/student flight actions and guard flight controls during autorotations significantly reduces the chance for successful corrective action.

Lesson Cost: Class A mishaps: UH-1H (2 cases)
Class B mishaps: UH-1H; OH-6; AH-1
Class C mishaps: UH-1H; OH-6 (2 cases); TH-55
Fatal injuries: 1
Nonfatal injuries: 3
Cost: $1,104,416

Problem #1: During critical phases of autorotations, instructor pilots become overconfident in the aviator/student and are therefore not sufficiently attentive to the flight control actions of the aviator/student, and place their hands and feet too far from the flight controls. Therefore, instructor pilots are not in a position to prevent, restrict, or recover from improper control inputs.

Corrective Action: Unit commander take positive command action to inform instructor pilots of this problem, monitor instructor pilot performance, and enforce compliance with requirements for proper monitoring and flight-control guarding.

Problem #2: Instructor pilots who are not current in the aircraft being flown or who have not received a standardization evaluation, may fail to detect and take corrective action for improper control inputs by students/pilots during critical phases of autorotations until safe recovery is impossible.

Corrective Action: Unit commander take positive command action to comply with AR 95-1, Chapter 6, para 6-12 by ensuring instructor pilots are current and evaluated in the aircraft to be flown before being assigned instructor duties.

Lesson Learned #11: Overconfidence, habit interference, and lack of training/experience will lead to improper flight control inputs during autorotations.

Lesson Cost: Class B mishaps: AH-1 (2 cases); OH-58
Class C mishaps: OH-6 (2 cases)
Nonfatal injuries: 1
Cost: $433,648

Problem #1: After the low rotor light and audio activated, pilot failed to immediately enter autorotation as required by instructions in TC 1-137 because of overconfidence. He felt capable of handling the situation without having to enter autorotation immediately. Consequently, when he finally did enter autorotation, there was insufficient rotor rpm to cushion the autorotative landing.

Corrective Action: Unit commander take positive command action to inform personnel of mishap problems and remedies, monitor aviator performance, and enforce compliance with guidelines governing the performance of autorotations.

Problem #2: Habit interference causes aviators to use improper flight control actions during autorotations. When a pilot/rated student has flown the majority of hours in one aircraft and then transitions to another, the pilot/rated student will transfer flight control habits from the previous aircraft that are inappropriate for the current aircraft type; e.g., transferring the habit of applying aft cyclic prior to touchdown during an autorotation, a correct response for one helicopter, to another in which it is incorrect.

Corrective Action: Unit commander take positive command action to ensure safety briefings include information regarding habit interference and its negative influences when transitioning from one aircraft to another.

Problem #3: Aviators use improper flight control actions during autorotations because of inexperience/inadequate training in different environmental conditions. Aviators who are trained to perform acceptable autorotations in an environment with pronounced depth perception cues, make mistakes during the performance of autorotative tasks when depth perception cues are not pronounced, e.g., in desert or while transitioning from daylight to dusk.

Corrective Action: Unit commander take positive command action to ensure aviators receive training/experience in the performance of autorotations in the varying geographic environments of the local area with significantly varying depth perception cues, e.g., flat and hilly terrain or during daylight and dusk hours. Also, ensure aviators are aware of the effect varying geographical conditions have on depth perception.

FLIGHT PLANNING TASKS

Lesson Learned #12: Failure of aviators to compute performance planning cards (PPC) and weight and balance forms as required during flight planning increases the probability of placing the aircraft in conditions outside its flight capability.

Lesson Cost: Class A mishaps: UH-1 (3 cases)
Class B mishaps: OH-58
Fatal injuries: 1
Nonfatal injuries: 11
Cost: $3,078,740

Problem: Because of overconfidence in their ability to handle changing conditions, aviators do not compute PPCs and weight and balance forms before flight. As a result, the aviator may unknowingly place the aircraft into conditions from which they cannot recover.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor their performance of these tasks, and enforce compliance whenever aviators are detected not computing PPCs or weight and balance forms.

Lesson Learned #13: Unit commanders who fail to establish a crew rest policy in accordance with guidance in AR 95-1 increase the probability of having fatigued aviators making critical errors.

Lesson Cost: Class A mishap: UH-1
Nonfatal injuries: 2
Cost: $927,634

Problem: A lack of unit guidance regarding crew rest requirements for aviators may result in aviators continuing flight duties after having inadequate rest. Fatigue adversely affects aviator decision-making capabilities regarding aircraft performance.

Corrective Action: Unit commander take positive command action to ensure crew rest policies are established. AR 95-1, Table 5-1, may be used as a guide in this effort.

BEFORE-FLIGHT INSPECTION

Lesson Learned #14: Inadequate self-discipline (improper attitudes, excessive self-motivation) will lead to errors of omission during preflight inspections.

Lesson Cost: Class A mishap: UH-1
Class C mishap: OV-1
Nonfatal injuries: 2
Cost: $658,643

Problem: Aviators who improperly perform preflight inspections have failed to detect unsecured engine cowlings and failed to remove tiedowns before flight. These actions were the result of an improper attitude regarding the requirement to perform preflight inspections and excessive haste to get the mission accomplished within specified time constraints.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance of preflight inspections, and enforce compliance when aviators are detected not properly using prescribed preflight inspection checklists.

TACTICAL AND SPECIAL TASKS

Lesson Learned #15: Failure of pilots-in-command/instructor pilots to properly monitor the flight actions of aviators inexperienced in flying in special or highly varying environments (e.g., mountains) reduces the probability of preventing/correcting critical errors.

Lesson Cost: Class A mishap: UH-1
Class C mishap: UH-1
Nonfatal injuries: 5
Cost: $976,823

Problem: Pilots-in-command/instructor pilots divert their attention from the flight actions of inexperienced copilots for extended periods of time while flying in special environments (e.g., mountains) because of overconfidence in the copilot's flying abilities. When the copilot commits critical errors, the pilot-in-command/instructor does not detect the problem in time for correction.

Corrective Action: Unit commander inform pilots-in-command/instructor pilots of the hazards involved when they allow overconfidence in others to adversely affect their attentiveness to copilot flight actions.

Lesson Learned #16: Aviators who intentionally violate written guidelines and verbal orders governing requirements for low-level flight increase the probability of wire strikes.

Lesson Cost: Class A mishaps: UH-1 (3 cases); OH-58
Fatal injuries: 4
Nonfatal injuries: 15
Cost: $3,817,739

Problem: Because of a lack of self-discipline, aviators intentionally fly their aircraft at low altitudes and high airspeeds in violation of oral and written guidelines. As a result, aviators encounter flight problems from which they cannot recover, e.g., wires.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance, and enforce compliance whenever aviators are detected knowingly violating flight regulations.

Lesson Learned #17: Unit commanders who participate in, or fail to correct subordinates who violate written guidelines governing airspeeds and altitudes for low-level flight encourage other breaches of flight discipline and safety.

Lesson Cost: Class A mishap: UH-1
Fatal injuries: 3
Nonfatal injuries: 6
Cost: $1,449,864

Problem: Unit commander allowed an aviator to fly at unauthorized low-level altitudes and violate regulations, SOPs and oral directives while he (commander) was aboard aircraft. As a result, the aircraft and personnel aboard were unnecessarily exposed to hazard. The aircraft struck a wire and crashed.

Corrective Action: Battalion commanders take positive command action to inform unit commander of this problem, monitor unit level activities, and enforce compliance whenever unit commanders are detected knowingly allowing aviators to violate flight regulations.

GROUND TAXIING

Lesson Learned #18: Lack of self-discipline (overconfidence) may result in unsafe aircraft speed during taxiing.

Lesson Cost: Class B mishap: JCH-47C
Cost: $122,391

Problem: Aviator routinely taxied a four-wheeled cargo aircraft at excessive speeds (greater than a brisk walk). This repeated violation of procedures made him overconfident in his ability to handle the aircraft at any ground speed.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance of taxiing tasks, and enforce compliance when aviators are detected exceeding safe taxi speed.

Lesson Learned #19: Lack of self-discipline (overconfidence) of pilots-in-command leads to improper monitoring of personnel.

Lesson Cost: Class B mishap: JCH-47C
Cost: $122,391

Problem: Pilot-in-command was overconfident in a copilot's capabilities and allowed him to routinely taxi cargo helicopters at excessive speeds without correcting this procedural violation.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor performance of pilots-in-command, and enforce compliance whenever pilots-in-command are detected allowing copilots to violate flight procedures.

Lesson Learned #20: Untrained personnel assigned to ground-guide tasks increase the probability of errors and mishaps.

Lesson Cost: Class C mishap: RV-1D
Cost: $48,000

Problem: A mechanic was assigned to perform ground-guide duties, a task which was not in his MOS and which he was inexperienced at performing. The mechanic, while trying to guide the nose of the OV-1D did not ensure clearance for all parts of the aircraft as it was taxiing on the ground.

Corrective Action: Unit commander take positive command action to revise the unit SOP in the area of taxi and ground handling operations to include a requirement for the use of trained and qualified ground guides.

NORMAL TAKEOFF TASKS

Lesson Learned #21: Failure of school training to prepare student pilots (prior to first solo) in the proper use of pedals to correct aircraft yaw during takeoff increases the probability of placing the aircraft into conditions from which flight control cannot be recovered.

Lesson Cost: Class C mishap: TH-55A
Cost: $34,439

Problem: Student pilot was unable to correct aircraft yaw and lost control of the aircraft during takeoff on first solo flight.

Corrective Action: TRADOC take positive command action to ensure student pilots are properly trained to handle all aircraft controls before being released for first solo flights.

Lesson Learned #22: Lack of self-discipline (overconfidence) while performing takeoffs from confined areas increases the probability of inadequate clearance of terrain/obstacles.

Lesson Cost: Class A mishap: UH-1V
Fatalities: 5
Cost: $1,444,075

Problem: Because a pilot was overconfident in his ability, he failed to follow procedures for safe takeoff and flight in a canyon while evacuating injured personnel. Rather than make an altitude over airspeed takeoff from a canyon, he attempted to fly at high speeds and low altitudes which was inappropriate for the mission and terrain. As a result, he was unable to negotiate a series of turns in the canyon and crashed.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance for signs of overconfidence, and enforce compliance with flight procedures whenever aviators are detected making errors due to overconfidence.

Lesson Learned #23: Visual inattention prevents proper maintenance of ground track during takeoff.

Lesson Cost: Class A mishap: OH-58A
Fatal injuries: 2
Cost: $1,064,680

Problem: Pilot had begun his takeoff when he started watching other aircraft in the area rather than monitoring his own ground track. As a result, the pilot allowed his aircraft to drift and collide with an aircraft departing in an adjacent lane.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance for signs of repeated inattention, and enforce compliance with prudent air discipline whenever aviators are detected being inattentive to flight tasks.

Lesson Learned #24: Failure to conduct crew briefings as required by aircraft operators manuals increases the probability of making critical crew coordination errors.

Lesson Cost: Class A mishap: AH-1S
Nonfatal injuries: 1
Cost: $204,578

Problem: Before a night takeoff from a confined area, pilot did not conduct a crew briefing because he felt it was unnecessary. He had flown with the copilot numerous times and was overconfident the copilot would automatically (without crew coordination) assist him in performing flight tasks should the need arise. As a result, while hovering, the pilot incorrectly assumed the copilot was crosschecking flight instruments.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance of crew briefings and enforce compliance whenever aviators are detected performing improper crew briefings.

Lesson Learned #25: The probability of critical errors increases when tower operators must function under task-overload conditions.

Lesson Cost: Class A mishap: OH-58A
Fatal injuries: 2
Cost: $1,064,680

Problem: A tower operator was required to provide traffic control assistance to numerous aircraft simultaneously. As a result, there was an insufficient amount of time available to devote to each aircraft and ensure adequate separation during takeoffs and landings.

Corrective Action: Unit commander take positive command action to ensure tower operators are provided work conditions that do not task overload the operators.

BASIC FLIGHT TASKS

Lesson Learned #26: Performing turns outside the capability of the aircraft increases the probability of losing aircraft control.

Lesson Cost: Class A mishap: OV-1D
Fatal injuries: 2
Cost: $3,189,634

Problem: Pilot was overconfident in his ability to perform a turn maneuver he knew to be outside the capability of the aircraft. As a result, he entered a minimum radius turn using a steep right bank. There was insufficient altitude for the maneuver.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance for signs of overconfidence, and enforce compliance with established flight procedures whenever aviators are detected performing maneuvers outside the aircraft's capability.

Lesson Learned #27: Sightseeing instead of attending to required flight tasks increases the probability of crew errors which place the aircraft in conditions beyond safe recovery.

Lesson Cost: Class A mishap: OH-58A
Nonfatal injuries: 2
Cost: $193,932

Problem: A pilot, while adding power to slow his rate of descent over a lake, began to sightsee boating and other water activities rather than attending to necessary flight tasks. As a result, the pilot failed to monitor his closure rate to the water and did not take corrective action until safe recovery was impossible.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance for signs of inattention, and enforce compliance with established flight procedures whenever aviators take errors due to inattention.

BEFORE-LANDING CHECKS

Lesson Learned #28: Operating aircraft while fatigued increases the probability of forgetting to perform critical before-landing checks.

Lesson Cost: Class C mishap: T-42A
Cost: $20,000

Problem: Instructor pilot's performance was degraded because of chronic fatigue. He had been working long hours the past 11 days. He had worked 14.9 hours in the last 24 hours and 23 hours in the 48 hours preceding the mishap. The pilot's degraded performance was reflected in his failure to perform a prelanding check, thus causing a gear-up landing.

Corrective Action: Unit commander ensure personnel are physiologically ready to perform required job tasks. Particular emphasis should be placed on ensuring aviators working long hours over many days are properly screened to prevent degraded performances due to chronic fatigue.

GO-AROUNDS

Lesson Learned #29: Instructor pilots who allow pilots to violate written guidance governing "go-arounds" increase the probability of placing the aircraft in conditions from which they cannot recover.

Lesson Cost: Class A mishaps: UH-1H, OV-1D
Fatal injuries: 1
Nonfatal injuries: 1
Cost: $3,311,641

Problem: An instructor pilot allowed a rated student pilot to attempt a go-around with less than maximum allowable power because of overconfidence in his own and the pilot's ability to handle any problem created by the violation. This delayed detection of a failed engine.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor instructor pilot performance for signs of overconfidence, and enforce compliance with flight procedures when errors due to overconfidence are detected.

Lesson Learned #30: Failure to follow procedures for ejection in the OV-1D can decrease the chances of aircrew survival.

Lesson Cost: Class A mishap: OV-1D
Fatal injuries: 1
Nonfatal injuries: 1
Cost: $2,388,941

Problem: An IP was overconfident in his own ability to handle the problem of dead engine. Therefore, the decision to eject during the go-around was delayed until safe egress was not possible.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance for signs of overconfidence, and enforce compliance with flight procedures when errors due to overconfidence are detected.

CONFINED AREA AND SLOPE OPERATIONS

Lesson Learned #31: Failure to perform reconnaissance of landing areas unnecessarily exposes the aircraft and crew to low level hazards (wires).

Lesson Cost: Class A mishap: OH-6A
Nonfatal injuries: 2
Cost: $140,750

Problem: Pilot failed to perform required high-level reconnaissance before beginning an approach to a confined area. The pilot did not detect wires which were in the area surrounded by foliage and woods.

Corrective Action: Unit Commander take positive command action to inform personnel of this problem, monitor aviator performance, and enforce compliance with flight procedures governing confined area reconnaissance.

Lesson Learned #32: Lack of self-discipline (inattention) during takeoff from sloping terrain increases the probability of improper flight control inputs and dynamic rollover.

Lesson Cost: Class A mishap: UH-1H
Cost: $922,704

Problem: During a takeoff from sloped terrain the copilot directed his attention to events outside the aircraft rather than to maintaining aircraft control. As a result, he applied excessive collective pitch with insufficient cyclic. Additionally, the copilot did not reduce collective pitch when upslope skid lifted first. These actions induced dynamic rollover.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance, and enforce compliance with requirements for correct job performance.

Lesson Learned #33: Fatigue and inexperience adversely affect aviator judgment during landings to sloping terrain.

Lesson Cost: Class B mishap: UH-1H
Nonfatal injuries: 1
Cost: $95,856

Problem #1: Because of fatigue, pilot inaccurately estimated clearance while making a slope landing. He had exceeded the maximum allowable duty limit for a 72-hour period by 15.5 hours.

Corrective Action: Unit commander take positive command action to ensure crew rest limits are not exceeded.

Problem #2: An inexperienced pilot, flying from the left seat, inaccurately estimated his rate of closure to a sloping cultivated field. The right skid contacted the ground and dug into soft mud thus becoming an anchor point about which the aircraft rolled right and crashed.

Corrective Action: Unit commander take positive command action to ensure personnel are ready/capable of performing job assigned.

Lesson Learned #34: Improper monitoring of inexperienced pilots puts the pilot-in-command in a position of being unable to correct or prevent errors during landings on sloping terrain.

Lesson Cost: Class B mishap: UH-1H
Nonfatal injuries: 1
Cost: $95,856

Problem: Pilot-in-command was preoccupied with tasks inside the aircraft and failed to apply attention to flight control actions of a low-time pilot making a slope landing. As a result, the pilot-in-command failed to detect and correct critical errors made by the pilot in estimating his terrain clearance and rate of closure.

Corrective Action: Unit commander take positive command action to ensure that pilots-in-command understand and execute their responsibilities for the safe operation of the aircraft.

APPROACHES

Lesson Learned #35: Lack of self-discipline (composure, overconfidence, judgment) increases the probability of failing to follow prescribed procedures for performing safe approaches and landings.

Lesson Cost: Class A mishaps: UH-1H (3 cases), FAH-1S
Class B mishap: UH-60A
Nonfatal injuries: 9
Cost: $2,226,502

Problem #1: Pilot was confused and apprehensive after unusual and unidentified vibrations in the airframe were felt and did not use a normal approach speed to land contrary to TC 1-135, Task #3502.

Corrective Action: Unit commanders take positive action to inform personnel of this problem, monitor aviator performance for lack of composure, and enforce compliance with flight procedures whenever errors due to loss of composure are detected.

Problem #2: Pilot did not maintain the minimum 3-5 rotor disc horizontal separation required by Task #6001, TC 1-138. He was making a short final to a landing zone (LZ) during formation flight. The pilot was overconfident in his ability and believed he could fly with less than the required separation with no problem. This resulted in an insufficient amount of space to properly position the aircraft in the LZ. Main rotor blades struck trees.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance for signs of overconfidence and enforce compliance with flight procedures whenever above flight task errors due to overconfidence are detected.

Problem #3: Pilots were unable to maintain aircraft alignment (approach) because of visual misperceptions induced by inexperience in flying in certain environments such as at night, in the desert, or in mountain terrain.

Corrective Action: Unit commander ensure personnel are prepared to perform. Pilots required to fly in new environments (e.g., night, desert, mountainous) should be checked out with an instructor pilot and should gain the experience that will allow them to properly adapt to the new environment.

Lesson Learned #36: Pilots-in-command who allow copilots to violate written guidance governing aircraft operations in dusty LZs increase the probability of brown-outs and loss of aircraft control.

Lesson Cost: Class A mishap: UH-1H
Nonfatal injuries: 3
Cost: $302,946

Problem: Pilot-in-command was overconfident in the copilot's abilities and allowed him to terminate an approach to a hover in a dusty LZ (contrary to instructions in the operators manual).

Corrective Action: Unit commanders ensure unit aviators designated as pilots-in-command understand their responsibilities of ensuring safe use of the aircraft and are aware of problems associated with overconfidence.

Lesson Learned #37: Lack of self-discipline adversely affects an aviator's ability to make sound decisions regarding by-the-book flight and safe aircraft operations during approaches.

Lesson Cost: Class A mishap: AH-1S
Class C mishap: TH-55A
Nonfatal injuries: 1
Cost: $1,600,990

Problem #1: Pilot-in-command displayed lack of self-discipline (improper attitude) by encouraging pilot to fly unauthorized maneuvers which exceeded the ability of the pilot and aircraft.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor aviator performance for signs of improper attitude, and enforce compliance with flight procedures whenever aviators are detected performing or allowing unauthorized maneuvers.

Problem #2: Pilot was in a hurry to return to the heliport because of deteriorating weather conditions. In his haste, the pilot reduced the throttle below necessary rpm, causing him to land tail low.

Corrective Action: Recommend unit commander inform personnel of this problem, monitor aviator performance for excessive haste, and enforce compliance with flight procedures whenever errors due to haste are detected.

Lesson Learned #38: Snow-covered landing sites create hazards by preventing visual identification of safe landing surfaces.

Lesson Cost: Class C mishap: JCH-47C
Cost: $43,150

Problem: A landing site was covered with snow obstructing from the pilot's view rocks and boulders on the selected site. The pilot had no reason to abort the approach and landing because he was unaware of the obstructions.

Corrective Action: Unit commander inform personnel of the problems associated with snow-covered landing sites.

HOVERING

Lesson Learned #39: Failure to train (transition) aviators in the operation of observation helicopters at maximum gross weight, low altitude and low airspeeds increases the probability of loss of aircraft control when these conditions are actually experienced.

Lesson Cost: Class C mishap: OH-6A
Nonfatal injuries: 2
Cost: $32,396

Problem: Pilot performed a flight action prohibited by the operators manual because of inadequate unit training. He received no classroom instruction or flight training in the operation of the observation helicopter at maximum gross weight. As a result, he was unaware of the marginal effectiveness of left pedal control during downwind turns at high weight/density attitude conditions. The pilot lost directional control of the aircraft when making a downwind hovering right turn.

Corrective Action: Unit commander upgrade unit training to include classroom and flight training in the operation of observation helicopters at maximum gross weight as prescribed in Chapter 2, TC 1-137.

Lesson Learned #40: Fatigue adversely affects an aviator's ability to correctly and safely perform hovering flight tasks.

Lesson Cost: Class A mishap: OH-58A
Nonfatal injuries: 1
Cost: $143,782

Problem: Observation helicopter pilot was fatigued from long hours in the cockpit (in excess of hours allowed in unit crew rest policy). This was a contributing factor to his application of incorrect flight control actions to control a right roll of the aircraft during a hover.

Corrective Action: Unit commander take positive command action to ensure compliance with established crew rest policy.

Lesson Learned #41: Failure to provide adequate guidelines in the observation helicopter operators manual for calculating conditions under which the anti-torque system is ineffective increases the probability of placing the aircraft into conditions causing a loss of directional control.

Lesson Cost: Class C mishap: OH-6A
Nonfatal injuries: 2
Cost: $32,396

Problem: The observation helicopter operators manual does not contain a directional control margin chart (as do other operators manuals). As a result, an aviator was not able to calculate the conditions under which the anti-torque system would become ineffective and he flew the aircraft into conditions causing loss of directional control.

Corrective Action: DARCOM upgrade instructions in TM 55-1520-214-10 to include a directional control margin chart similar to those in the operator's manuals for other helicopters.

Lesson Learned #42: Failure to ensure flight surgeon assistance is available to aviators with significant psychological problems (e.g., fear of flying at night) increases the probability of unsafe flight performance.

Lesson Cost: Class B mishap: AH-1S
Nonfatal injuries: 1
Cost: $73,474

Problem: Aviator with expressed fear of flying at night, in addition to depression, frustration and anxieties, lost his composure while firing rockets at night and crashed an aircraft. Aviator's problems had been controlled previously by a flight surgeon; however, no flight surgeon was made available in the four months prior to the mishap.

Corrective Action: Unit commander ensure adequate flight surgeon support is provided to aviation personnel to monitor, detect, and treat those with significant psychological problems.

Lesson Learned #43: Lack of self-discipline (overconfidence, inattention, lack of composure) while performing hover tasks increases the probability of making critical errors.

Lesson Cost: Class A mishaps: UH-1 (2 cases), OH-58A, AH-1S
Class B mishaps: UH-1H, CH-47C
Class C mishaps: UH-1H, OH-58A
Nonfatal injuries: 12
Cost: $3,837,963

Problem #1: Pilot-in-command was overconfident in the flight skills of the aviator at the controls and allowed him to attempt to hover between aircraft parked too close together.

Corrective Action: Unit commander inform personnel of this problem, monitor aviator performance for signs of overconfidence and enforce compliance with flight procedures whenever errors due to overconfidence are detected.

Problem #2: Aviators improperly divided their attention between flight tasks while hovering and made critical errors regarding aircraft attitude and drift.

Corrective Action: Unit commander inform personnel of this problem, monitor aviator performance for inattention and enforce compliance with flight procedures whenever errors due to inattention are detected.

CARGO HOOK ASSEMBLY FAILURE

Lesson Learned #44: Although not technically a lesson learned, it has been determined that at least one accident was caused by a UH-1 cargo hook assembly failure during sling load operations.

Lesson Cost: Class A mishap: UH-1H
Cost: $201,946

Problem: Cargo hook on UH-1H failed during external load operations, allowing the load to be dropped from 1,000 feet above ground level. The cause of the failure is undetermined.

Corrective Action: Insufficient information exists to identify corrective actions.

HYDRAULIC MALFUNCTION

Lesson Learned #45: Inadequate quality control during manufacture or assembly of the UH-60 No. 1 hydraulic pump module and inadequate maintenance increases the probability of critical failures.

Lesson Cost: Class A mishap: UH-60A
Cost: $428,948

Problem #1: The No. 1 hydraulic pump module failed because quality control during manufacture or assembly was inadequate. The pump cylinder barrel had several cracks through the barrels which were not detected. This defect allowed the pump to overheat which led to other damage to the pump, overpressurization, and auto ignition of the hydraulic fluid.

Corrective Action: DARCOM develop and implement procedures to ensure adequate quality control of the manufacture of UH-60 hydraulic pumps.

Problem #2: Maintenance personnel failed to replace a hydraulic pump that showed signs of overheating; e.g., melted overflow lines.

Corrective Action: Unit commander take positive command action to inform personnel of this problem, monitor the performance of maintenance personnel, and enforce compliance whenever improper maintenance practices are identified.

MAIN ROTOR SYSTEM FAILURE

Lesson Learned #46: The intentional use of improper blade-folding procedures (UH-60) increases the probability of critical failures in the flight control system.

Lesson Cost: Class A mishap: UH-60A
Fatal injuries: 4
Cost: $3,091,200

Problem: TM 55-1520-237-23-4 requires that the pitch change rod upper ends be disconnected prior to folding the blades. The unit failed to comply with this requirement and used their own procedure to fold the blades without disconnecting the pitch change rod. This procedure eventually resulted in a flight control system failure.

Corrective Action: Unit commander take positive command action to ensure that all maintenance procedures (e.g., blade-folding operations) are performed IAW the appropriate technical manual.

TAIL ROTOR MALFUNCTION

Lesson Learned #47: Although not technically a lesson learned, it has been determined that at least one accident was caused by failure of a TH-55 tail rotor strap assembly (stress corrosion induced).

Lesson Cost: Class C mishap: TH-55A
Cost: $26,491

Problem: Tail rotor strap assembly failed due to stress corrosion of undetermined origin.

Corrective Action: DARCOM perform studies to determine solution to the stress corrosion of the tail rotor strap assembly.

Lesson Learned #48: Although not technically a lesson learned, it has been determined that at least one accident was caused by a UH-1M tail rotor pitch change bolt failure.

Lesson Cost: Class A mishap: UH-1M
Nonfatal injuries: 3
Cost: $314,834

Problem: The cause of the pitch change bolt failure is unknown.

Corrective Action: DARCOM perform studies to determine the cause of this and other similar bolt failures.

POWER PLANT FAILURE

Lesson Learned #49: Although not technically a lesson learned, it has been determined that at least one accident was caused by the failure of a fuel control governor main shaft.

Lesson Cost: Class A mishap: OH-58A
Nonfatal injuries: 2
Cost: $144,867

Problem: The cause of the OH-58A governor main shaft bearing failure is unknown. It is suspected that the lubricating agent (grease) of the bearing is not adequate for the required operation. The internal temperature of the governor may exceed the maximum temperature of the lubricating agent during NOE operations. Under these conditions bearing failure would occur.

Corrective Action: DARCOM perform studies and evaluate the specifications of the lubricating agent (grease) to determine its capability for adequate performance at the high temperatures encountered during sustained NOE operations.

Lesson Learned #50: Failure to design UH-1 compressor blade retaining pins to handle expected stresses increases the probability of retaining pin failures from stress corrosion.

Lesson Cost: Class B mishaps: UH-1 (2 cases)
Cost: $367,926

Problem: Failure of the UH-1H engine compressor blade retaining pin (PN 1-300-263-01) resulted in the compressor blade sliding forward in its retention slot and contacting the stator vanes. This led to disintegration of the T53 engine. The retaining pin failed before reaching its expected service life because of stress corrosion.

Corrective Action: DARCOM expedite replacement of the inadequately designed compressor blade retaining pins with the new generation retaining pins (PN: 1-300-26-8-2) in all T53 engine compressor sections to comply with temporary engineering directive, T5310023, April 1977.

Lesson Learned #51: Although not technically a lesson learned, it has been determined that at least one accident was caused by a failure of no. 4 bearings in a UH-1H engine.

Lesson Cost: Class B mishap: UH-1H
Cost: $105,566

Problem: The cause of the UH-1H bearing failure is undetermined.

Corrective Action: Unknown.

Lesson Learned #52: Although not technically a lesson learned, it has been determined that at least one accident was caused by N_2 droop in an OH-58C engine.

Lesson Cost: Class C mishap: OH-58C
Nonfatal injuries: 1
Cost: $29,384

Problem: The cause of N_2 power droop in an OH-58C is unknown.

Corrective Action: DARCOM conduct research/studies to determine the causes of these types of malfunctions and initiate proper corrective action.

DRIVESHAFT FAILURE

Lesson Learned #53: Inadequate technical inspection of utility helicopter tail rotor driveshaft couplings increases the probability of failing to correct maintenance errors.

Lesson Cost: Class A mishap: UH-1H
Cost: $923,754

Problem: Organizational maintenance personnel failed to install cotter pin in the retaining bolt of the tail rotor driveshaft coupling during required maintenance. The technical inspector failed to inspect maintenance work contrary to FM 55-411 and did not identify the maintenance error.

Corrective Action: Unit commander take positive command action to ensure maintenance technical inspectors comply with inspection procedures when performing aviation maintenance-related duties.

FLIGHT CONTROL FAILURE

Lesson Learned #54: Failure to take action on identified materiel deficiencies that cause mishaps results in continued materiel failures and mishaps from these failures.

Lesson Cost: Class A mishap: AH-1S
Fatal injuries: 2
Cost: $2,235,700

Problem: Action was not taken to correct materiel problems and initiate recommendations identified in an FY 81 AH-1 mishap. Required actions were to:

a. Initiate testing to determine the frequency, magnitude, and direction of loads applied to the AH-1 pitch link tube.

b. Initiate fatigue testing based on updated load data.

c. Assign a finite service life to AH-1 pitch link tubes.

d. Require adequate inspection of AH-1 pitch link tubes.

An FY 82 AH-1 mishap resulted from the same materiel problem.

Corrective Action: DARCOM take necessary action(s) to correct materiel deficiencies identified in mishaps. Ensure required testing, inspection and procedures are implemented to correct identified AH-1 pitch link tube deficiencies.

Lesson Learned #55: Although not technically a lesson learned, it has been determined that at least one accident was caused by failure of a UH-1H red side scissors-lever pivot bolt.

Lesson Cost: Class A mishap: UH-1H
Fatal injuries: 2
Cost: $1,359,704

Problem: The cause of a UH-1H pivot bolt failure is unknown.

Corrective Action: DARCOM perform studies to determine why the pivot bolts are failing.

DRIVE TRAIN FAILURE

Lesson Learned #56: Inadequate design and overhaul quality control of the CH-47C transmissions increase the probability of input bearing failures.

Lesson Cost: Class A mishap: CH-47C
Fatal injuries: 46
Cost: $5,394,478

Problem #1: Quality control during overhaul/manufacture of a CH-47C helicopter failed to identify and remove all the walnut shells used to clean the metal surface of the forward transmission. As a result, the shells blocked the lubricator bearing jets. This caused failure of the forward transmission input bearings.

Corrective Action: DARCOM/DESCOM develop and implement a comprehensive inspection procedure that will ensure contaminants are not present in CH-47 series transmission lubrication systems prior to releasing CH-47 helicopter fleet for further flight operations. Ensure use of walnut shells or similar abrasive cleaning agents is discontinued or adequate methods are developed and implemented to ensure their complete removal.

Problem #2: Design of the CH-47C cockpit warning system is such that it does not provide timely warnings of contamination and/or impending input bearing failure in the CH-47C transmissions.

Corrective Action: DARCOM redesign the CH-47C cockpit warning system so it will provide a positive cockpit indication of an impending input pinion bearing(s) failure through a multi-parameter logic process.

Problem #3: Design of the CH-47C transmissions is such that they do not supply oil to the input bearings when the current system fails.

Corrective Action: DARCOM perform studies to determine the feasibility of incorporating an auxiliary/redundant lubrication/oil supply system.

Problem #4: Design of the CH-47C transmission lubrication jets are inadequate in that they are so small they become easily blocked. As a result, walnut shells used for cleaning the transmission blocked these lubricator jets and lubrication could not reach the input bearings.

Corrective Action: DARCOM perform studies to evaluate the feasibility of enlarging the lubrication jets to reduce their susceptibility to clogging/blockage.

SECTION II

OBSERVATIONS FROM SAFETY EVALUATION OF AVIATION UNITS

INTRODUCTION

Three battalion/squadron-sized organizations with good safety records were surveyed onsite by USASC. The organizations were an air cavalry squadron, a combat aviation battalion and an aviation battalion, each with a different organizational structure and mission. The purpose of the survey was to identify factors responsible for the good safety record of these organizations. The areas of interest surveyed were: (1) Management, (2) Operations, (3) Training, (4) Mishap Prevention Program, and (5) Aviation Medicine. The following is a summary of the results of the survey. All observations included in this report were common to at least two of the organizations surveyed. Most were found to be present in all three.

OBSERVATIONS

I. MANAGEMENT

A. Highly Qualified Aviation Commanders (Company and Battalion Levels)

- Commander positions filled with individuals having extensive aviation background and experience.
- Commanders had extensive aviation technical knowledge.
- Commanders were strong in management and leadership abilities.

B. Commanders Established Performance Criteria

- Clearly defined performance criteria for all phases of operations.
- Ensured personnel were aware of the performance criteria.

C. Highly Selective Pilot-in-Command Appointment Process

- Aviators had to demonstrate knowledge of general flying, aircraft and aircraft systems, local flying area, unit mission, etc.
- Selection process considered input from established pilots-in-command, platoon leaders, instructor pilots, and aviation safety officers.
- Pilot-in-command was considered a status earned instead of something which was automatically given.

D. Individual Training Established as Top Priority For Flying Hour Usage

- Development of knowledge, skills, and combined overall capabilities of the individual aviator was considered primary responsibility of command.
- Establishing individual aviator training as the first priority ensured availability of flying time to achieve/maintain flight proficiency standards.

E. Positive Support From Higher Headquarters

- Aviation commanders received strong support from higher headquarters, especially in safety-related command decisions.

.I. OPERATIONS

A. Flight Operations Conducted By The Book

- Aviators were proud of the fact that their organization conducts flight operations by the book.
- Aviators would not accept anything less.
- Senior aviators assist training the inexperienced aviators in by-the-book operations.

B. Aviators Self-discipline and Police Their Own

- Aviators demonstrated a high degree of professionalism.
- Senior aviators accepted the responsibility of policing their own.

C. Immediate and Effective Enforcement Action Taken Against Violators of Proper Flight Discipline

- Immediate and effective enforcement action of leaders reinforced self-discipline.
- Immediate and effective action created an awareness of intolerable behaviors and the consequences of any deviation from proper flight discipline.

D. Flight Missions Well Planned

- Commanders actively involved in operations planning to include ensuring unit policies were followed and all safety aspects considered.
- Essential staff and special staff (aviation safety officer, instructor pilots/standardization instructor pilots, etc.) active involvement required by commander.

E. Careful Crew Selection for Each Mission

- Total aviator flight time (experience) was considered for skills attained.
- Recent aviator flight time (experience) was considered for skills maintained.
- Experience was paired with inexperience.
- Flight crew skills were matched with type mission to be flown.

F. Strong NonCommissioned Officers Leadership in Maintenance Operations

- Noncommissioned officers were competent in their technological skills.
- Noncommissioned officers supervised their personnel.
- Noncommissioned officers made on-the-spot corrections.
- Noncommissioned officers emphasized operations by the book.

G. Excellent Quality Control in Maintenance Operations

- Considered essential for safe flight operations.
- Considered the strength of the maintenance program.
- Technical inspectors never sacrificed quality for quantity.
- Commanders would not tolerate sacrificing quality for quantity.

H. Maintenance Performed By The Book

- Command encouraged maintenance by the book.
- Required maintenance manuals were available to personnel.
- Maintenance officers/noncommissioned officers ensured maintenance was performed by the book.
- Maintenance personnel peer pressure encouraged maintenance by the book.

III. TRAINING

A. Command Emphasis Placed on Training

- Training standards were established.
- Training was conducted to those standards.

B. Instructor Pilots/Instrument Flight Examiners: Enforcing The Safety And Standardization Program

- By-the-book flying stressed by all instructor pilots.
- No-notice checkrides performed to great advantages.
- Instructor pilots instilled confidence in aviators.
- Instructor pilots were "instructing," not just administering checkrides.

C. Top Priority of Training on Individual Aviator Proficiency

- Prioritized flight-hour usage (individual training, team training, mission support) enhanced aviator proficiency.
- Individual aviator training increased aviator's capabilities in basic tasks while minimizing limitations in accomplishing required aircraft training manual tasks.

D. Emphasis Placed on Skilled Qualification Test Training at All Chain of Command Levels

- Noncommissioned officer managed.
- Command monitored.

V. MISHAP PREVENTION PROGRAM

A. Aviation Safety Officers Were Involved and Supported

- Experienced aviators selected as safety officers.
- Actively involved in unit operations.
- The influence and effectiveness of aviation safety officer enhanced by command support.

B. Safety Surveys Were Performed and Results Acted On

- Identified special hazards/problems.
- Command supported by action on results.
- Enhanced safe by-the-book operations.

C. Safety Programs Well Managed

- Appointment of senior aviators (credibility) as safety officers was key to well-managed programs. Aviators and commanders "listen up" to safety when skilled/experienced safety officers speak.
- Commanders made known their support for the aviation safety officers and the safety program.

V. AVIATION MEDICINE

A. Optimum Use of Flight Surgeons

- Used primarily in aviation medicine specialty.
- Other medical duties minimized.

B. Flight Surgeons Supported Individual Aviators

- Know most aviators well.
- Gave high degree of attention to individual aviator medical needs.

C. Flight Surgeons Were Involved in Unit Safety Program

- Frequent involvement in unit safety briefings.
- Enhanced aviator knowledge of aeromedical aspects of flying.

D. Flight Surgeon Support Aviator Units

- Extensively involved in unit aeromedical needs.
- Timely advice provided commanders regarding aviation medicine matters.

E. Flight Surgeon Credibility

- Highly respected by aviators surveyed.
- Highly respected by commanders surveyed.

F. Flight Surgeon Support of Aviators' Families

- Enhanced knowledge of aviator/family interrelationships.
- Enhanced medical care of aviators' families.

CONCLUSIONS

The organizations surveyed had good safety records. Observations were presented on factors contributing to this success. The following conclusions were drawn from these observations:

1. Management techniques employed were not unusual or new. However, the key to these successful organizations was that management actually practiced these techniques.

2. Commander involvement was one of the most important factors found in these successful mishap prevention programs. A variety of leadership techniques were employed, but they were all successful because of command involvement throughout the entire organization.

3. The following command actions were key elements in the management of these organizations:

a. Established performance criteria.

b. Ensured all personnel were aware of the performance criteria.

c. Ensured training was conducted to a standard.

d. Ensured operations were by the book.

e. Took immediate and effective action against deviations from established performance criteria.


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